

## **ABSTRACT**

A group of Double-Sided High- $T_c$  Superconducting (HTS) Magnetic-Dipole Micro-Antennas is provided. The multi-resonant double-sided HTS magnetic dipole  
5 micro-antenna are fabricated using thin-film ( $\tau_{\text{YBCO}} \approx 3000\text{\AA}$ ) YBCO material (with  $T_c \approx 92\text{ K}$ ). The substrate is a single  $\text{LaAlO}_3$  crystal (with the loss-tangent of  $\tan\delta \approx 10^{-5}$ ,  $\epsilon_r \approx 24$ ) with the thickness of  $\tau_{\text{LAO}} \approx 508\mu\text{m}$ . Each antenna is comprised of a combination of co-centric loop and spiral structures, patterned on both sides of the substrate without ground plane. Due to their geometric structures, each antenna demonstrates a multi-  
10 resonant characteristic. The comparison between the overall dimensions of the device ( $22 \times 22\text{ mm}^2$ ) and variation of the wavelength at resonances indicate a typical ratio of  $D/\lambda \approx 10^{-2}$  between the largest loop diameter and the longest wavelength. A multi-resonant double-sided spiral HTS magnetic dipole micro-antenna, a multi-resonant double-sided folded log-periodic HTS magnetic dipole micro-antenna and methods for reducing  
15 antenna length with a multi-resonant double-sided HTS magnetic dipole micro-antenna are also provided.